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# A Race Against Time to Rescue a Reef From Climate Change

In an unusual experiment, a coral reef in Mexico is now insured against hurricanes. A team of locals known as "the Brigade" rushed to repair the devastated corals, piece by piece.

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When Hurricane Delta hit Puerto Morelos, Mexico, in October, a team known as the Brigade waited anxiously for the sea to quiet. The group, an assortment of tour guides, diving instructors, park rangers, fishermen and researchers, needed to get in the water as soon as possible. The coral reef that protects their town — an undersea forest of living limestone branches that blunted the storm's destructive power — had taken a beating.

Now it was their turn to help the reef, and they didn't have much time.

"We're like paramedics," said María del Carmen García Rivas, director of the national park that manages the reef and a leader of the Brigade. When broken corals roll around and get buried in the sand, they soon die. But pieces can be saved if they are fastened back onto the reef.

"The more days that pass, the less chance they have of survival," she said.

The race to repair the reef is more than an ecological fight; it's also a radical experiment in finance. The reef could be the first natural structure in the world with its own insurance policy, according to environmental groups and insurance companies. And Hurricane Delta's force triggered the first payout — about $850,000 to be used for the reef's repairs.

The success or failure of this experiment could determine whether communities around the world start using a new tool that marries nature and finance to protect against the effects of climate change. The response to Delta was a first test.

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When the Brigade laid eyes on their reef, which runs 28 kilometers south of Cancún and is home to critically endangered elkhorn coral, it looked ransacked. Structures the size of bathtubs were flipped upside down. Coral stalks lay like felled trees. Countless smaller fragments of broken coral coated the seafloor.

On the boat, cement mixers prepared a special paste that snorkelers ferried down to divers who spent hours underwater carefully fastening pieces back on the reef. They used inflatable bags to turn over large formations rolled by the storm and collected fragments to seed new colonies.

María del Carmen García Rivas en route to the damaged reef.

A rainstorm approached Cancún hotels just north of the reef in November.

The Brigade’s members, mostly volunteers, delighted in the bright damselfish that darted into restored crevices even before the paste had hardened. But there was so much to do and so little time.

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At the end of a grueling day, Tamara Adame, a diving instructor

and guide, wondered if the tiny team could make a dent. “Is it actually going to make a difference that I’m here all day picking up the pieces?” she asked herself.

## ‘Like water in the desert’

Just as a house is insured against fire, or a car against crashes, last year a 167-kilometer stretch of the coast, including the reef, was insured against hurricanes with a wind speed of 100 knots or greater, which is a Category 3 storm.

It didn’t take long for the policy to pay off: Hurricane Delta slammed into the reef in October. The governor of the state of Quintana Roo announced the payout on Facebook Live: 17 million pesos.

Ideally, reefs wouldn’t need such interventions. After all, they’ve been surviving hurricanes for millennia.

But in Quintana Roo, like so many parts of the world, humans have weakened coral, tiny tentacled animals that secrete layers of limestone to build outer skeletons for themselves. Rising sea temperatures, ocean acidification, sewage pollution and overfishing leave coral more vulnerable to hurricane damage.

And hurricanes themselves are becoming more severe because of climate change. This year, the Atlantic has seen the most named storms on record.

Environmentalists and insurance companies behind the effort hope it becomes a model for protecting other far-flung coastlines, whether in Florida or Indonesia, insuring not just coral reefs but also mangroves, salt marshes and other natural barriers to storms. These nature-based defenses protect coastal properties and biodiversity all at once.

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“Having this insurance policy is really like water in the desert,” said Efraín Villanueva Arcos, the environment secretary for Quintana Roo, who leads a trust that determines how the money

gets spent. Without it, he said, the government would have struggled to fund the repair work.

Brigade members mixed the special paste used by divers to reattach broken coral.

A diver collected sand to be used in the paste.

Some scientists and environmentalists point to philosophical and practical concerns. They protest that the policy reduces the reef to a commodity. It diverts money to private companies that could instead be spent directly to protect the local people and environment. It can't address longer-term threats from climate change that are killing the reef anyway.

But "if we want to move the needle on how we are impacting nature," said Fernando Secaira, a specialist on climate risk and resilience at the Nature Conservancy who helped bring about the insurance policy, "we need to move into economic terms."

## Every piece 'a possible colony'

"Brigade, we will try to save as much as we can," Dr. García Rivas wrote on the group's WhatsApp chain, trying to rally her exhausted team for the next long day. "Each fragment is a possible colony, keep it up!!!!!!!"

Locals had volunteered boats, food and themselves, but she needed more of everything. And she figured they had only one short month to complete the first phase — repairing, stabilizing and collecting broken corals — before those pieces would be too far gone to save. And while she heard the insurance money was coming, how quickly would it arrive?

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To cover immediate costs for fuel and food, Mr. Secaira of the Nature Conservancy had approved $1,000 from a different fund, and Dr. García Rivas fronted money from her own pocket. "Luckily I don't have kids to feed, so I had some savings," she said.

The Brigade was created in 2018. Its members joined as volunteers, but the idea was that if a hurricane hit, money from a payout would help tide them over while tourists stayed away.

The Covid-19 pandemic, however, complicated everything. Tourism

had been dead for months before Hurricane Delta struck, but just as reef restoration began, visitors started trickling back. That meant some Brigade members, such as Ms. Adame, the diving instructor, suddenly had clients again. “I couldn’t refuse the work,” she said. “I really needed the income.”

A balloon is used to right a big piece of broken coral.

She could spend only two days with the Brigade. In fact, of the Brigade’s 36 members, less than half were participating on any given day.

The depleted volunteers completed 11 days of restoration work before a new hurdle stopped them: Another hurricane, Zeta, began hurtling toward the Gulf of Mexico. It made landfall as a Category 1 storm — not enough for a payout, even though locals said it lashed the coast harder.

Then, Zeta was followed immediately by even more bad weather, keeping them out of the water for an agonizing 13 days. Brigade members feared their work would be lost.

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As soon as the port reopened, they sped to the areas of the reef where they had spent the most time on repairs. Parts were so battered that Dr. García Rivas had trouble recognizing where she was.

“I felt powerless,” she said, “confused by so much disaster.” But closer inspection showed that while the reef’s periphery was a mess, some of their work in the center had withstood the second hurricane. “When I saw the fragments that we had glued still standing in place, I had a feeling of hope,” she said.

They got to work again.

## Would anyone buy it?

Back in 2015, Kathy Baughman McLeod, who was then director of climate risk and resilience at the Nature Conservancy, asked a profound question: Could you design an insurance policy for a coral reef?

On its face, the idea might have seemed absurd. For starters, nobody owns a reef, so who would even buy the policy? And it’s not easy assessing the damage to something that’s underwater.

But Ms. Baughman McLeod, along with Alex Kaplan, then a senior executive at Swiss Re, a leading insurance company, came up with workarounds. First, the policy could be purchased by those who benefit from the reef — in this case, the state of Quintana Roo, which is also home to Cancún and Tulum and has a tourism economy estimated at more than $9 billion.

“Without that reef, there’s no beach,” Mr. Kaplan said. “Without that beach, there’s no tourists.”

Second, rather than basing the payout on reef damage, it could be triggered by something far easier to measure: The storm’s wind speed. The stronger the wind, the worse the assumed damage to the reef.

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The idea of putting a dollar value on a reef or ecosystem by identifying a “service” that it provides has become increasingly popular. For example, coastal salt marshes protect from flooding — offering economic benefits on top of environmental ones. Peat bogs store vast amounts of carbon, keeping it out of the atmosphere where it would worsen global warming. And coral reefs reduce the energy of waves by 97 percent, protecting coastal properties.

Divers prepared to ferry paste to the reef in November.

Reefs can reduce the potential for waves to cause damage during storms, but face many threats.

But this notion of "ecosystem services" is controversial in some circles.

"It's a popular concept because it commodifies nature and it allows people to put a dollar value on nature," said Terry Hughes, who directs a center for coral reef studies at James Cook University in Australia. "But it's very anthropocentric and it's certainly not about protecting nature for nature's worth. It's almost kind of selfish."

If you look at it from the reef's perspective, Dr. Hughes said, hurricanes are the least of its problems. Climate change, coastal pollution and overfishing are far greater threats.

But given the scale of the planet's intertwined environmental emergencies — not only climate change but the collapse in biodiversity — conservationists say they must be pragmatic. More than a million species are at risk of extinction, including many coral species.

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And in Puerto Morelos, monetizing the reef had the almost ironic consequence of helping some in the community understand that it is actually invaluable. "My experience with the Brigade has changed my thinking so much," said Alejandro Chan, who takes tourists sport fishing and snorkeling. "I have to help the reef."

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Still, any money governments spend on insurance premiums is money that can’t go toward reducing greenhouse emissions or directly helping people prepare for the next storm, said Zac Taylor, a research fellow at K.U. Leuven, a university in Belgium, who studies the intersection of finance and climate risk.

Dr. Taylor also questioned whether insurers will keep offering such policies if the bigger threat, climate change, which generates worsening hurricanes, isn’t brought under control. “Will they stick around?” Dr. Taylor asked.

Boats from the Brigade above the reef in November.

Brigade members at work.

## Setbacks and success

By early December, even the corals broken by Zeta were barely healthy enough to save. Still, the Brigade pressed ahead. So far its members have braced or cemented almost 12,500 fragments, and turned over or stabilized more than 2,000 larger coral formations.

“Champion Brigade!!!!!” Dr. García Rivas cheered on WhatsApp.

But their efforts exposed the scale of the challenge in responding to reefs after hurricanes. They exhausted themselves patching up vital but limited sections. Another team in Cancún performed a much smaller intervention there.

And the insurance money itself faced delays that hindered the work. It took two or three weeks for the government to receive the payout, and then almost another month for the trust, made up of government officials along with a representative from the tourism industry, to decide how to distribute it.

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“If the insurance money had been available in a timely manner,” said Claudia Padilla, a researcher at the National Fisheries and Aquaculture Institute in Mexico, which developed the Brigade’s

hurricane response protocols and trained its members, “the results of the rescue effort could have been greatly multiplied.”

Still, the money will be put to its intended purpose of restoration, funding longer-term projects like seeding of new colonies and replenishment of reef biodiversity. And Mr. Secaira of the Nature Conservancy believes that the rest of the world will use Quintana Roo as proof of concept.

Indeed, as the Brigade was at work in Puerto Morelos, a bill in Guam’s Legislature sought to evaluate insuring a reef there. Training is underway in other locations in Mexico, Belize and Honduras.

But it won’t be easy. The training in Honduras had to be postponed when the country was hit by two hurricanes, Eta and Iota, within just two weeks. They were the Atlantic Ocean’s 28th and 30th named storms of the year.

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